

L'immodificabilità del passato. Scienze dell'uomo e scienze della natura a confronto.

Università degli Studi di Cagliari, May 23-24 2019

Temporal location of events in language and (non) persistence of the past

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SECTION 1

TEMPORAL LOCATION OF EVENTS (IN TENSED LANGUAGES)

Tensed verbs

Languages like English have **tensed forms of the verb** which (possibly in interaction with **time adverbs**) express the location of an event in time with respect to a **reference point** (typically, the moment at which the sentence is uttered):

- (1) Macron **was** in China (**yesterday**).
- (2) Macron **is** in China (**now**).
- (3) Macron **will be** in China (**tomorrow**).

Tense in linguistics

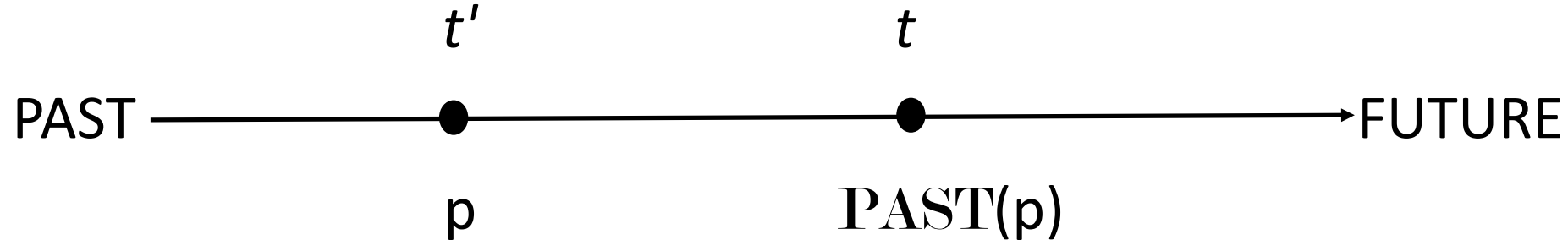
- **Tense** is grammaticalised expression of location in time.

“[For grammatical categories, including tense, w]hat one finds most typically is the choice of the **speech situation** as the reference point [...]. As far as tense is concerned , then, the reference point is typically the present moment, and **tenses locate situations** either **at the same time as the present moment**, or **prior to the present moment**, or **subsequent to the present moment**.”

(Bernard Comrie, *Tense*, 1985)

Priorian tense operators (Arthur N. Prior 1967)

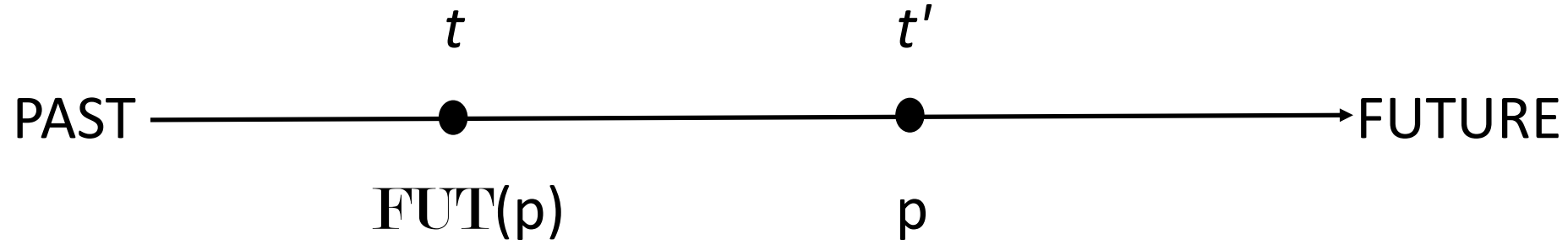
- $[[\text{PAST}(p)]]^t = 1$ *if and only if (iff)* for some $t' < t$ $[[p]]^{t'} = 1$
($\text{PAST}(p)$ is true at t *if and only if* p is true at a time t' in the past of t)



- In typical cases, the time of evaluation t coincides with the present time (the time at which the sentence is uttered)

Priorian tense operators (cont.)

- $[[\text{FUT}(p)]]^t = 1$ iff for some $t' > t$ $[[p]]^{t'} = 1$
($\text{FUT}(p)$ is true at t if and only if p is true at a time t' in the future of t)



- In typical cases, the time of evaluation t coincides with the present time (the time at which the sentence is uttered)

An example

Suppose you utter (1) now (23 May 2019):

(1) Macron **was** in China.

Priorian logical structure of (1):

(1') **PAST**(Macron *is* in China)

$[[(1')]]^{23/05/19} = 1$ iff for some $t' < 23/05/19$ $[[\text{Macron is in China}]]^{t'} = 1$

((1') is true on 23 May 2019 *if and only if* 'Macron is in China' is true at some time t' in the past of 23 May 2019)

Problems for the Priorian analysis of tense (Barbara Partee 1973)

➤ Deictic (referential) use of the past tense

Suppose you utter (4) at 5PM while driving on the highway to go to the sea:

(4) I didn't turn off the stove!

“The sentence clearly **refers to a particular time [...]** whose identity is **generally clear from the extra-linguistic context**, just as the identity of the *he* in [the sentence *He shouldn't be in here*] is clear from the context.”

(B. Partee, *Some structural analogies between tenses and pronouns in English*, 1973)

- Two possible Priorian analyses of (4):

(4') PAST(NOT(I turn off the stove))

(4'') NOT(PAST(I turn off the stove))

$[[(4')]]^{5PM} = 1$ iff for some time $t' < 5PM$ $[[\text{NOT}(\text{I turn off the stove})]]^{t'} = 1$

(4') is true at 5PM *if and only if* 'I turn off the stove' is false at some time t' in the past of 5PM (\Rightarrow *sometimes in the past I didn't turn off the stove*)

$[[(4'')]]^{5PM} = 1$ iff for no time $t' < 5PM$ $[[\text{I turn off the stove}]]^{t'} = 1$

(4'') is true at 5PM *if and only if* 'I turn off the stove' is true at no time t' in the past of 5PM (\Rightarrow *never did I turn off the stove in the past*)

- These truth conditions are either **too weak** or **too strong**:
there are lots of moments in the past in which you did not turn off the stove and
there are lots of moments in the past in which you turned off the stove.

Hybrid Tense Logic (Patrick Blackburn 1993)

“Hybrid [tense] logics are logics that result by adding further expressive power to ordinary [tense] logic. The most basic hybrid logic is obtained by adding so-called **nominals** which are **propositional symbols of a new sort, each being true at exactly one [moment].”**

(Stanford Encyclopedia of Philosophy, *Hybrid Logic*)

- Nominal ‘i*’ is true at exactly the moment at which you should have turned off the stove (e.g., ‘i*’ is a proposition that univocally describes the state of the universe at the moment in question).
- Hybrid tense logical analysis of (4):

(4_{HTL}) PAST(i* & NOT(I turn off the stove))

(4) is true at 5PM (on 23 May 2019) if and only if ‘I turn off the stove’ is false at some time t in the past of 5PM coinciding with the moment the speaker is referring to which is univocally described by i^*

Hybrid Tense Logic and Reichenbachian semantics of tense

“A particularly important form of token-reflexive symbol is found in the tenses of verbs. The tenses determine time with reference to the time point of the act of speech, i.e., of the token uttered. A closer analysis reveals that the time indication given by the tenses is of a rather complex structure.”

(H. Reichenbach, *Elements of Symbolic Logic*, 1947)

In his semantic analysis of tense, Reichenbach distinguishes three notions:

- **Speech point** (S, time point of the token)
- **Reference point** (R, the time of reference with respect to which the event is temporally located)
- **Event point** (E, the running time of the event)

- A strong empirical motivation for Reichenbach's analysis comes from **compound (perfect) tenses**, e.g. the **Past Perfect** in (5), as opposed to the **Simple Past** in (6):

(5) [CONTEXT SENTENCE: Mary arrived at 3PM.] Peter had left.

Peter's departure < Mary's arrival

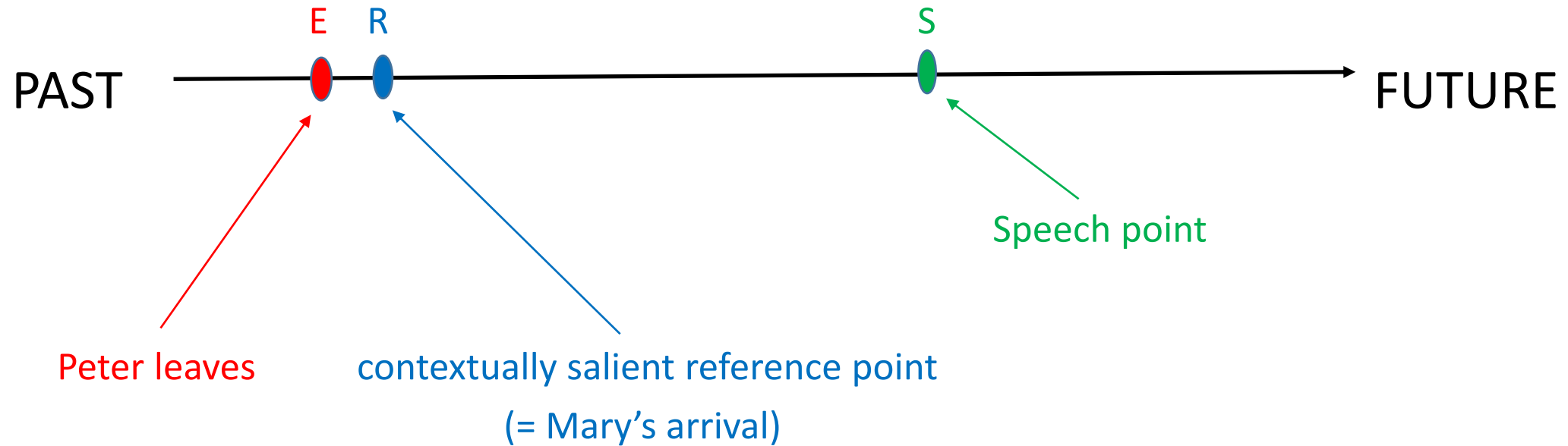
(6) [CONTEXT SENTENCE: Mary arrived at 3PM.] Peter left.

Mary's arrival \leq Peter's departure

“From a sentence like [(5)] we see that the **time order expressed in the tense** does not concern one event, but **two events, whose positions are determined with respect to the point of speech**. We shall call these time points the **point of the event** and the **point of reference**. In the example the point of the event is the time when Peter [left]; the point of reference is a time between this point and the point of speech. In an individual sentence like the one given it is not clear which time point is used as the point of reference. This determination is rather given by the context of speech.”

(H. Reichenbach, 1947)

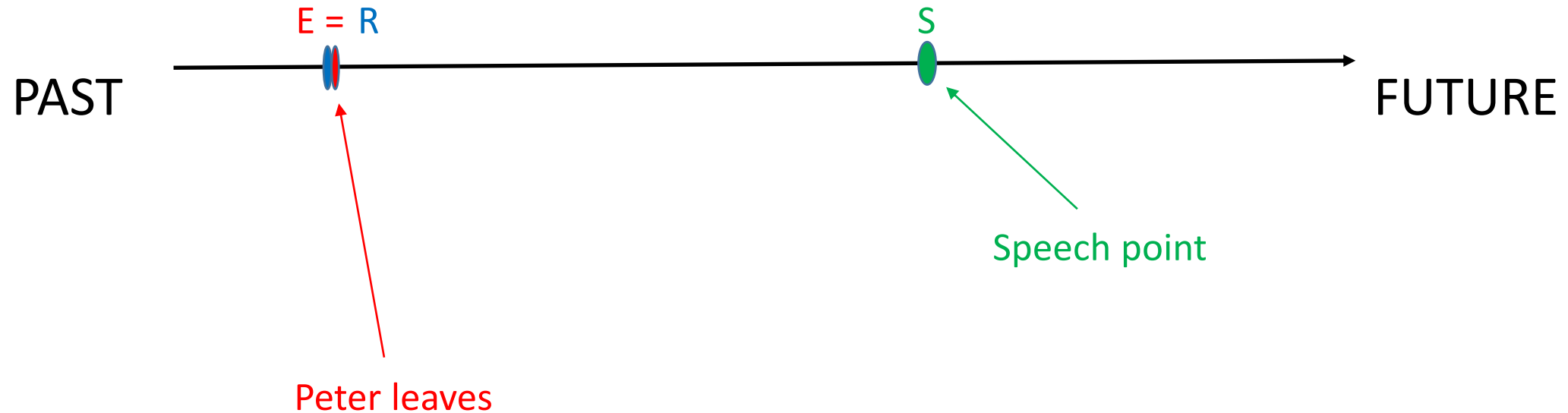
(5) [CONTEXT SENTENCE: Mary arrived at 3PM.] Peter had left.



Using 'r*' as a nominal describing the Reichenbachian reference point R, we obtain the Hybrid Tense Logic analysis (5_{HTL}) for sentence (5):

(5_{HTL}) $\text{PAST}(r^* \ \& \ \text{PAST}(\text{Peter leaves}))$

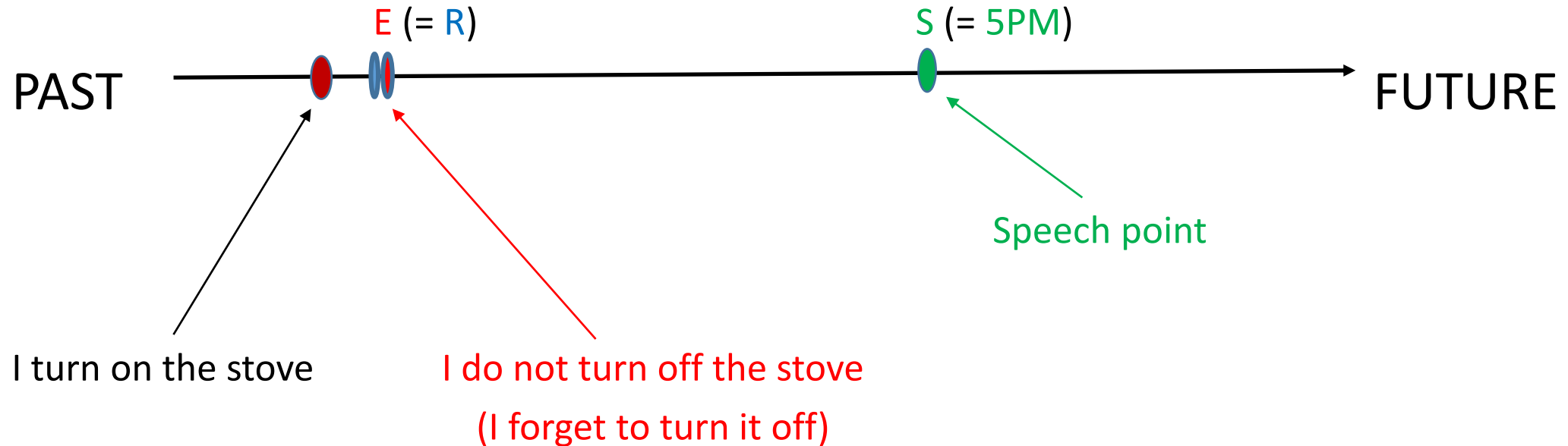
(6) [CONTEXT SENTENCE: Mary arrived at 3PM.] Peter left.



Using 'r*' as a nominal describing the Reichenbachian reference point R, we obtain the Hybrid Tense Logic analysis (6_{HTL}) for sentence (6):

(6_{HTL}) PAST(r^* & Peter leaves)

(4) I didn't turn off the stove!



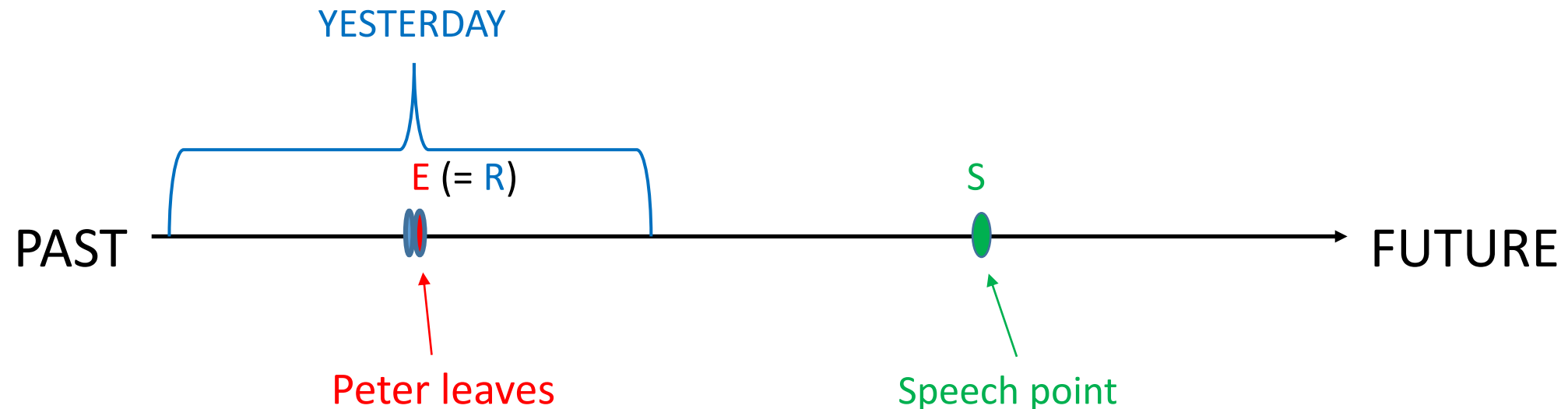
Using 'r*' as a nominal describing the Reichenbachian reference point R, we obtain the Hybrid Tense Logic analysis (4_{HTL}) for sentence (4):

(4_{HTL}) $\text{PAST}(r^* \ \& \ \text{NOT}(\text{I turn off the stove}))$

Interaction between tense and time adverbs (David Dowty 1979)

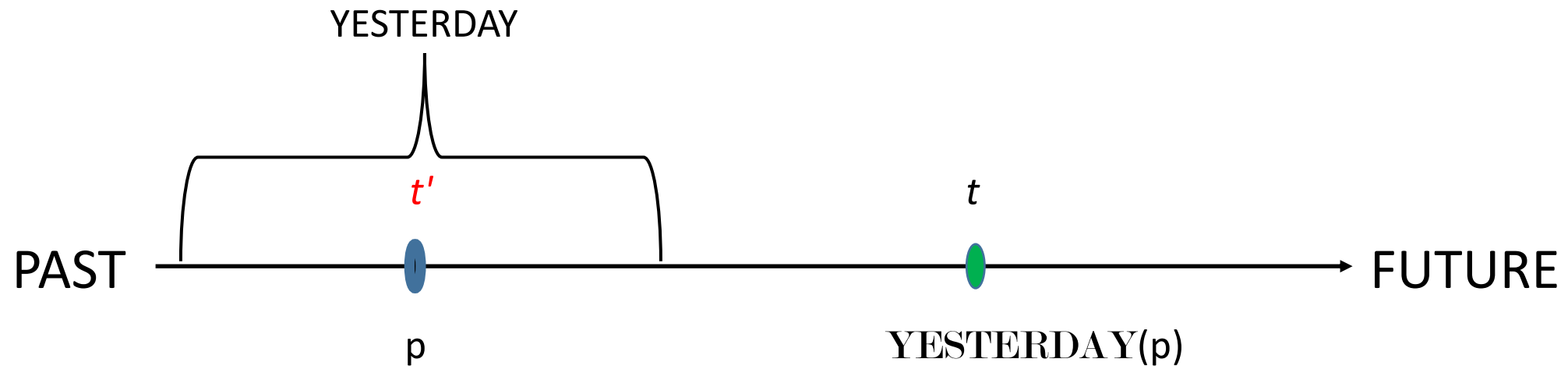
Time adverbs are typically used to constrain the temporal location of events:

(7) Peter left *yesterday*.



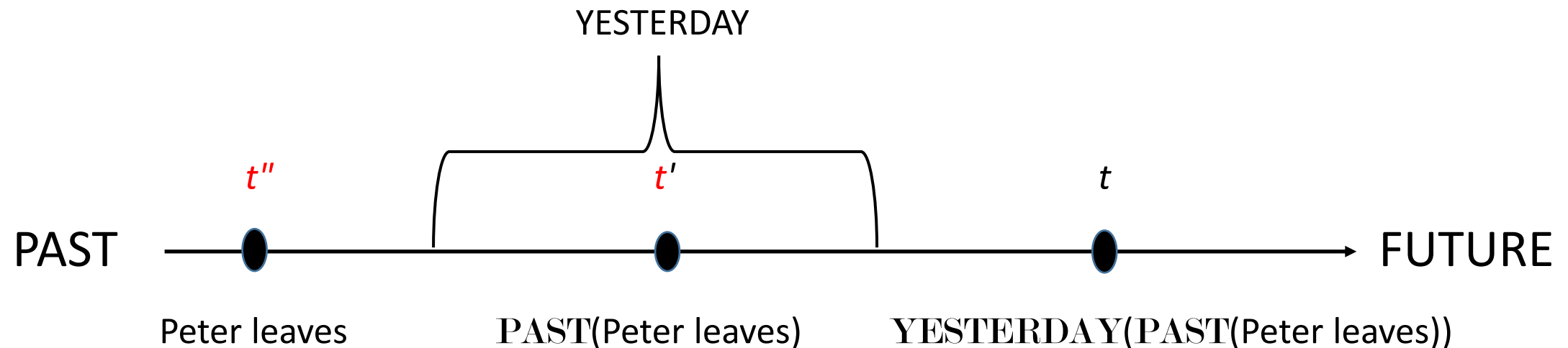
Operator-based analysis of “yesterday” (D. Dowty 1979)

YESTERDAY(p) is true at t *iff* p is true at some time $t' < t$ which is within the day before t



(7) Peter left yesterday \Rightarrow (7') YESTERDAY(PAST(Peter leaves))

YESTERDAY(PAST(Peter leaves)) is true at t iff PAST(Peter leaves) is true at some time $t' < t$ which is within the day before t iff 'Peter leaves' is true at some time t'' such that, for some time $t' < t$ which is within the day before t , $t'' < t'$



This analysis does not work: it predicts that (7) is true now if Peter left one year ago!

The same problem arises if we let the tense operator **PAST** scope over **YESTERDAY**:

(7'') **PAST**(**YESTERDAY**(Peter leaves))

(D. Dowty, *Word Meaning and Montague Grammar*, 1979: 323)

Time adverbs in Hybrid Tense Logic

Hybrid Tense Logic helps us out of the problem of the interaction of tense and time adverbs:

- independently from one another, tense and time adverb take scope over the nominal r^* representing Reichenbach's reference time

(7_{HTL}) $\text{PAST}(r^* \ \& \ \text{Peter leaves}) \ \& \ \text{YESTERDAY}(r^*)$

(7_{HTL}) is true at t *iff*

- (a) 'Peter leaves' is true at some $t' < t$ coinciding with the moment the speaker is referring to which is univocally described by r^* and
 - (b) r^* is true at a time $t' < t$ which is within the day before t
- (\models 'Peter leaves' is true at some $t' < t$ which is within the day before t)

SECTION 2

DIRECTIONALITY OF TIME IN LANGUAGE AND BRANCHING FUTURES

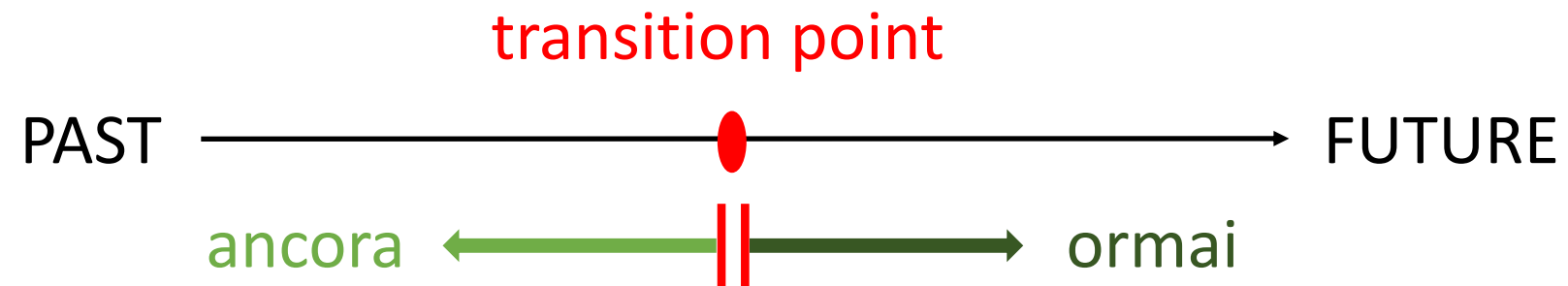
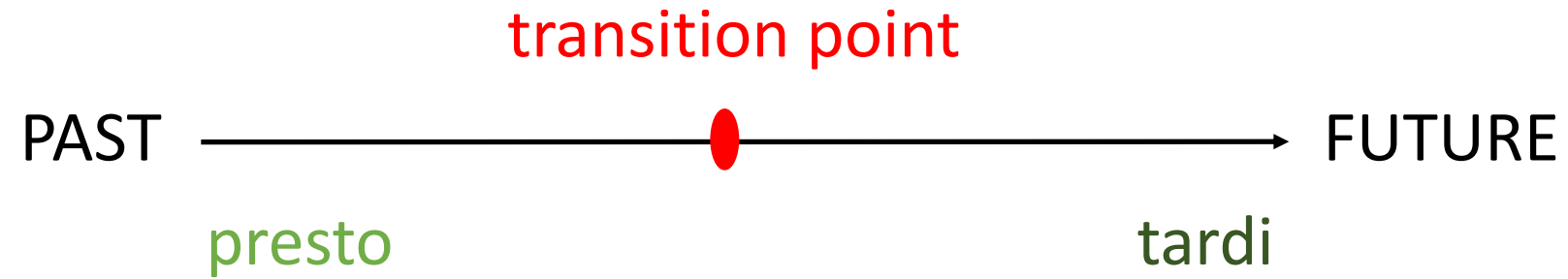
Temporal asymmetries (polarised scalar adverbs)

(1) È ormai/già tardi.
‘It is already late.’

(2) ??È ancora tardi.
‘It is still late.’

(3) È ancora presto.
‘It is still early.’

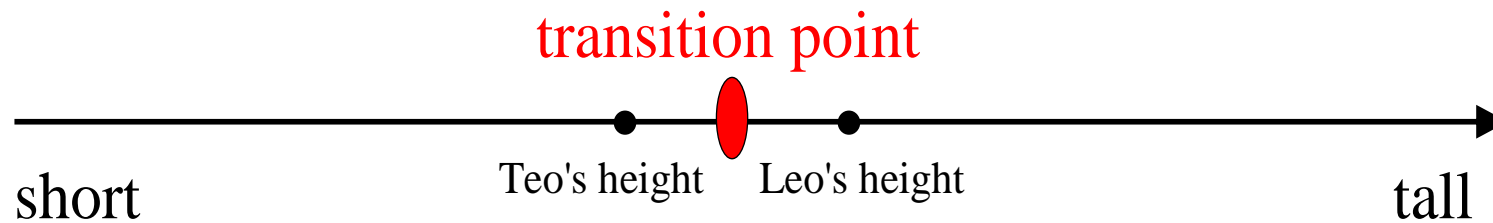
(4) ??È ormai/già presto.
‘It is already early.’



Polarised scalar adverbs in non-temporal domains, 1

Context NT1. *We are looking for **tall persons** for a certain task.*

*The **minimal height is 1m80cm (transition point).***



(5a) Leo è 1m85, è **già** (abbastanza) alto. ('Leo is 1m85, he is already tall.')

(6a) Teo è 1m75, è **ancora** (troppo) basso. ('Teo is 1m75, he is still short.')

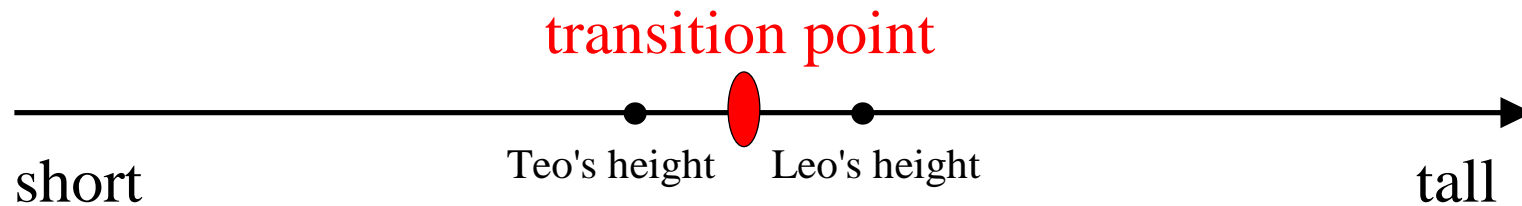
The following sentences would be meaningless in Context NT1:

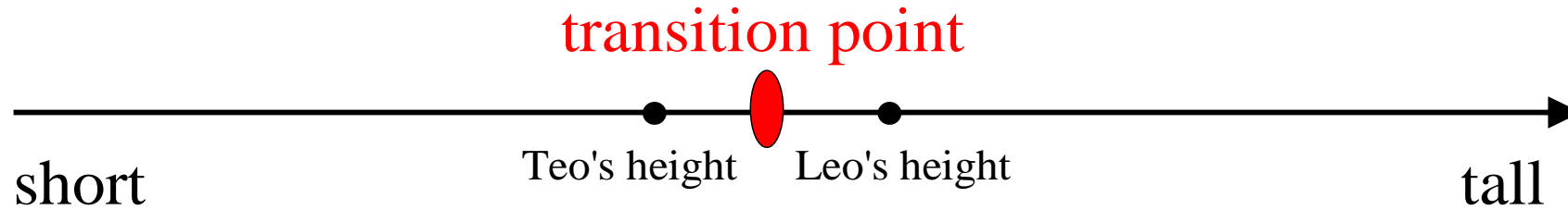
(5b) Leo è 1m85, è ancora (troppo) alto.

(‘Leo is 1m85, he is still tall.’)

(6b) Teo è 1m75, è già (abbastanza) basso.

(‘Teo is 1m75, he is already short.’)





“Già” in non-temporal domains: **upward persistence of a property**

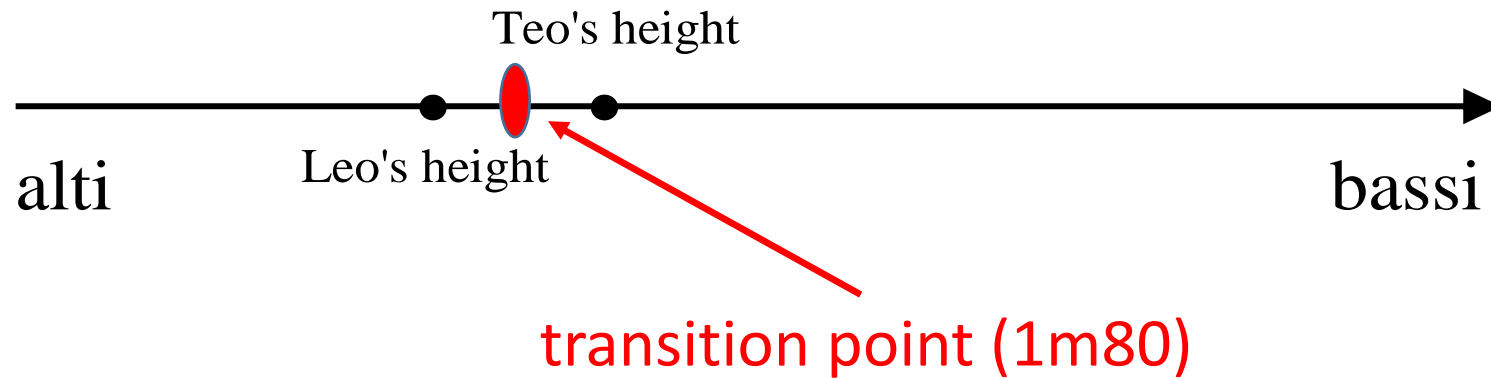
- Leo’s height is enough and the same is true of any height **following** Leo’s on the reference scale.

“Ancora” in non-temporal domains: **downward persistence of a property**

- Teo’s height is not enough and the same is true of any height **preceding** Teo’s on the reference scale.

Polarised scalar adverbs in non-temporal domains, 2

Context NT2. *We are looking for **short persons** for a certain task.*
*The **maximal height is 1m80cm.***



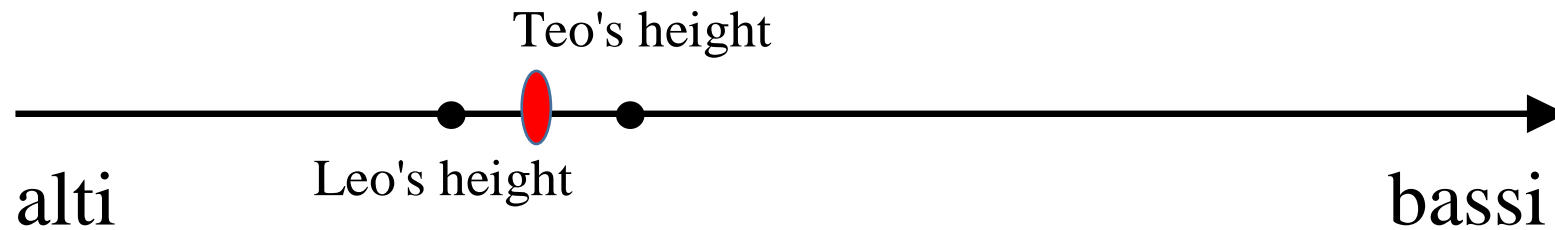
(5b) Leo è 1m85, è **ancora** alto.

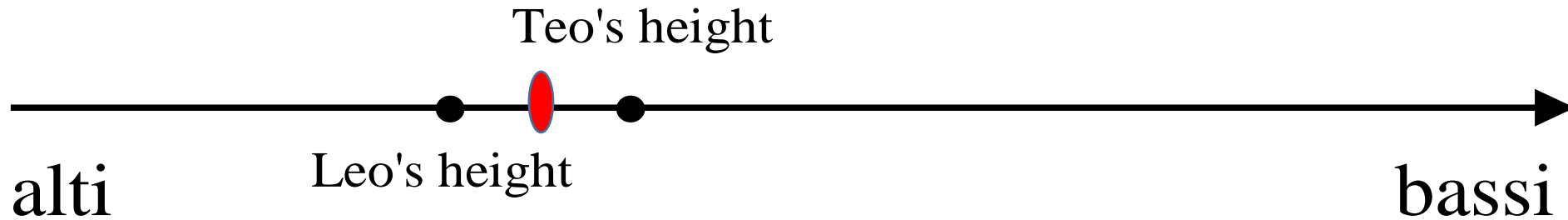
(6b) Teo è 1m75, è **già** basso.

The following sentences would be meaningless in Context NT2:

(5a) Leo è 1m85, è già alto.

(6a) Teo è 1m75, è ancora basso.





“Già” in non-temporal domains: **upward persistence of a property**

- Teo’s height is small enough and the same is true of any height **following** Teo’s on the reference scale.

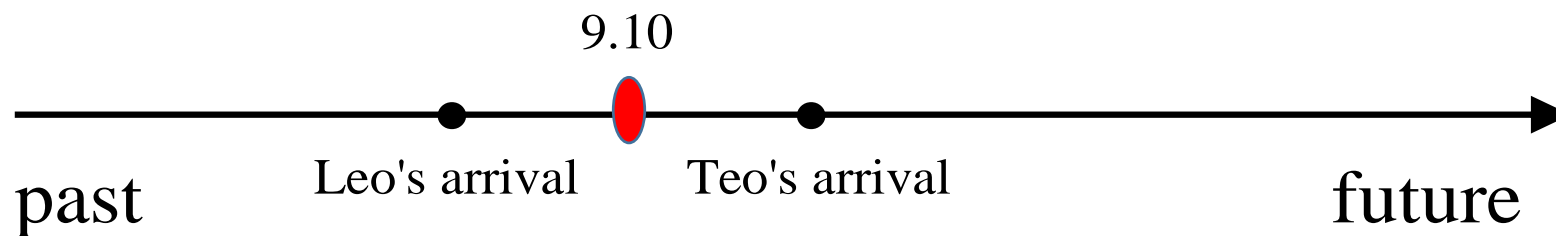
“Ancora” in non-temporal domains: **downward persistence of a property**

- Leo’s height is not small enough and the same is true of any height **preceding** Leo’s on the reference scale.

Polarised scalar adverbs in temporal domain, 1

Context T1. We are waiting for our friends, Leo and Teo.

They are expected to arrive by 9PM.



At 9:10PM we can say:

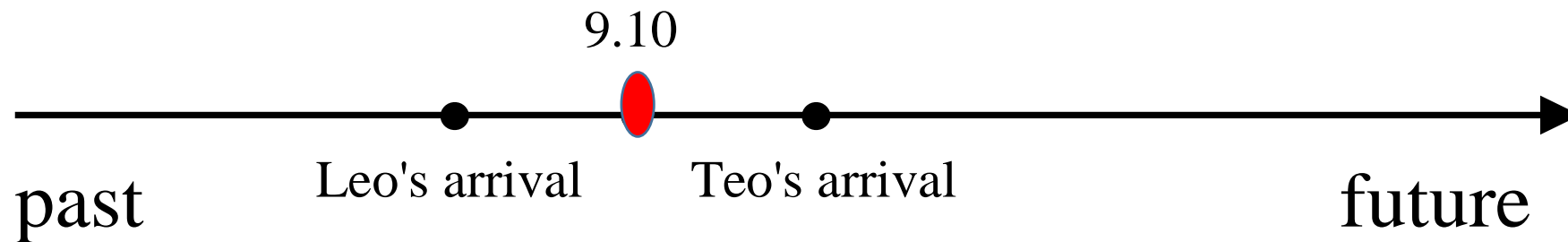
(7a) Leo è **già** arrivato. ('Leo has already arrived.')

(8a) Teo **ancora** non è arrivato. ('Teo still has not arrived.')

The following sentences would be meaningless in Context T1:

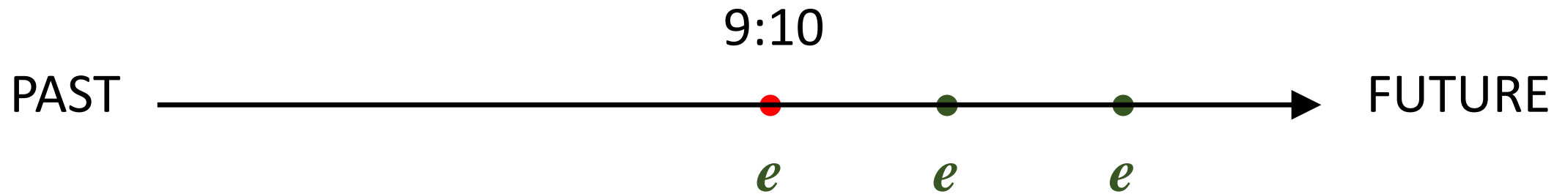
(7b) Leo è ancora arrivato. ('Leo has still arrived.')

(8b) Teo è già non arrivato. ('Teo has already not arrived.')



(7a) Leo è già arrivato.

[Asserted at 9:10PM]

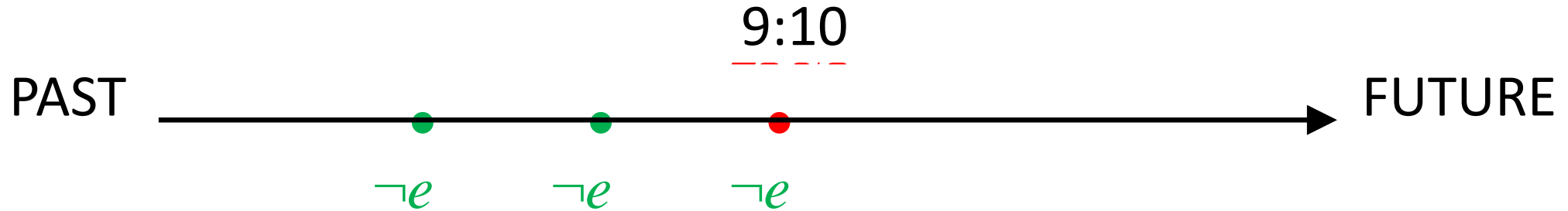


e = *Leo's having arrived*

“Già” in the temporal domain: **forward persistence of a (result) state**

- Leo's having arrived holds at 9:10PM and it also holds at any time **following** 9:10PM on the time scale

(8a) Teo ancora non è arrivato. [Asserted at 9:10PM]



$\neg e = \text{Teo's not having arrived}$

“Ancora” in the temporal domain: **backward persistence of a state**

- Teo's not having arrived holds at 9:10PM and it also holds at any time **preceding** 9:10PM on the time scale

⇒ "già" in temporal domains: *forward persistence* of a state

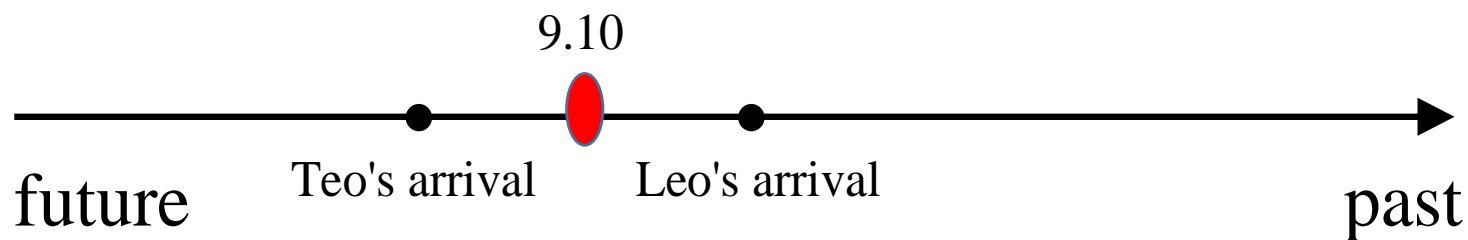
$$\exists t \in \mathbf{I} [\varphi(t) \wedge \forall t' \in \mathbf{I} [t < t' \rightarrow \varphi(t')]]$$

⇒ "ancora" in temporal domains: *backward persistence* of a state

$$\exists t \in \mathbf{I} [\varphi(t) \wedge \forall t' \in \mathbf{I} [t' < t \rightarrow \varphi(t')]]$$

Polarised scalar adverbs in temporal domain, 2

Context T2. Like Context T1, but we try to rescue (7b)-(8b) from unacceptability by *reversing the time scale*:



(7b) Leo è **ancora** arrivato.

➤ Alle 9:10PM, Leo è ancora (nello stato di essere) arrivato

(8b) Teo è **già** non arrivato.

➤ Alle 9:10PM, Teo è già (nello stato di essere) non arrivato

The moral about time *vs.* other types of scales

- (7b)-(8b) continue to be meaningless, even when considered against the reversed time scale of Context T2.
- Apparently, we just cannot reverse the time scale in the same way as we reversed the non-temporal scale for the pair of gradable adjectives *alto* ('tall') - *basso* ('short').

Asymmetry between past and future in language

- A linear representation of time (such as we have adopted so far) may be too simplistic for natural language.
- The past is fixed and determinate, the future is open and indeterminate (Aristotle, Prior 1967, Thomason 1984, Condoravdi 2003, Bonomi & Del Prete 2008, Giannakidou & Mari 2017):

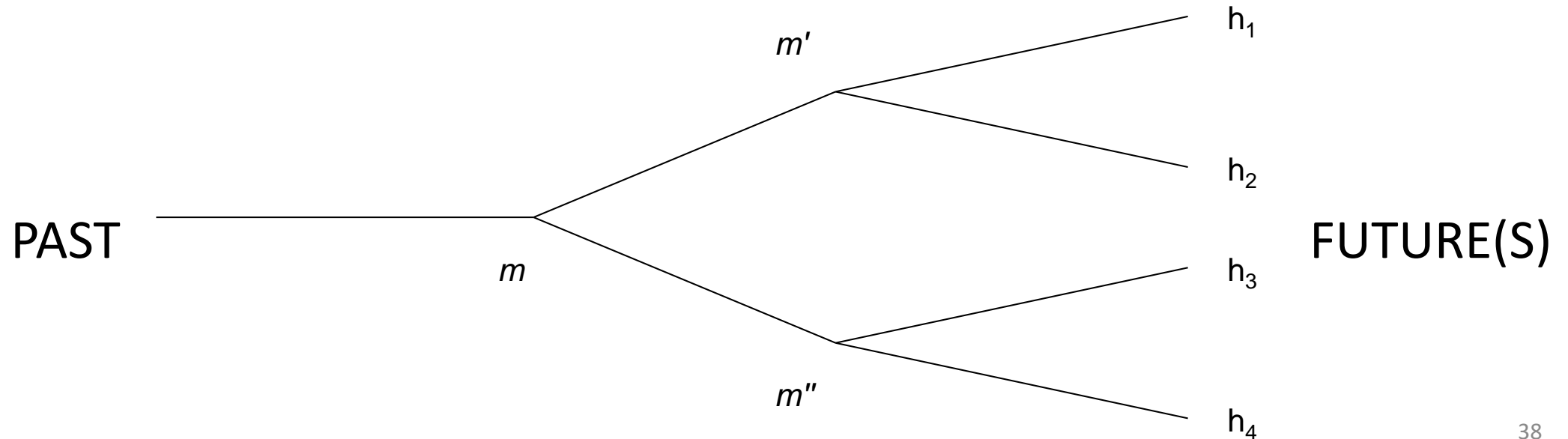
(9a) Leo will come to the party. But if you don't come, he might change his mind.

(9b) Leo came to the party. ??But if you didn't come, he might have changed his mind.

Branching Time: many futures, one past (Prior 1967, Thomason 1984, Belnap et al. 2001, a.o.)

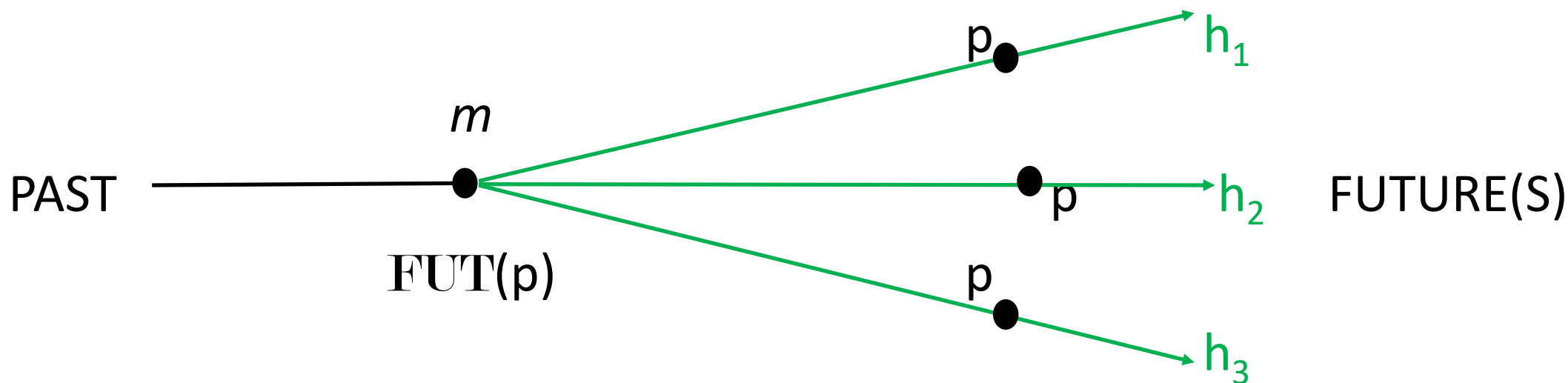
- Our world, considered at any moment m , has a unique fixed past and present (the past and the present at m) and many open futures (the possible futures at m).

A suitable representation of our world, as it is at a moment m , depicts it as the cluster of all histories passing through m .



Future tense in Branching Time: the Peircean solution (Prior 1967)

- $\text{FUT}(p)$ is true at m if and only if p is true *on every history passing through m* at a moment following m



- Future tensed sentences are essentially *necessity modal sentences*.

- Peircean solution predicts that the future contingent statement (FC) is equivalent to the necessity modal statement (FN):

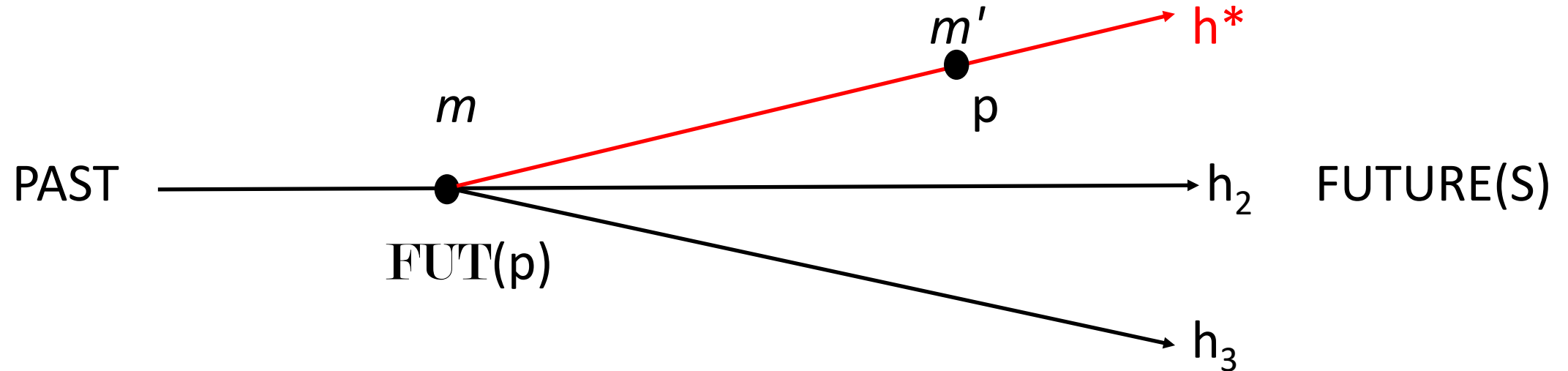
(FC) There will be a sea battle tomorrow.

(FN) It is now necessary that a sea battle will occur tomorrow.

➤ This is undesirable!

Future tense in Branching Time: the Ockhamist solution (Prior 1967)

- $\text{FUT}(p)$ is true at m if and only if p is true at a moment m' following m on the history h^* that will be actual



- Although there are many possible futures, only one will be actual. A future tensed statement targets *this only future*.

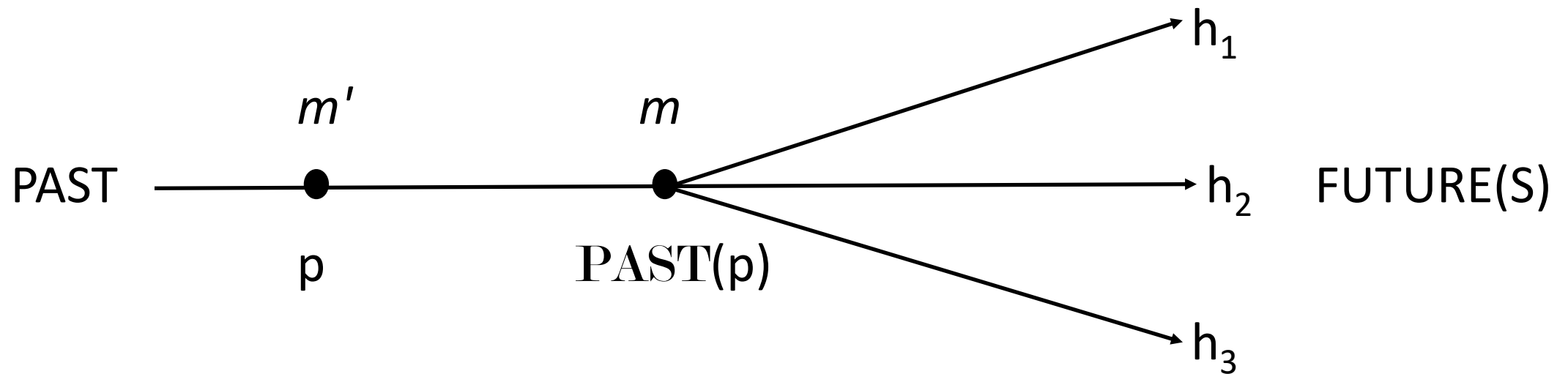
- Unlike the Peircean solution, the Ockhamist solution preserves the contingent character of (FC), as distinct from the necessity modal statement (FN):

(FC) There will be a sea battle tomorrow.

(FN) It is now necessary that a sea battle will occur tomorrow.

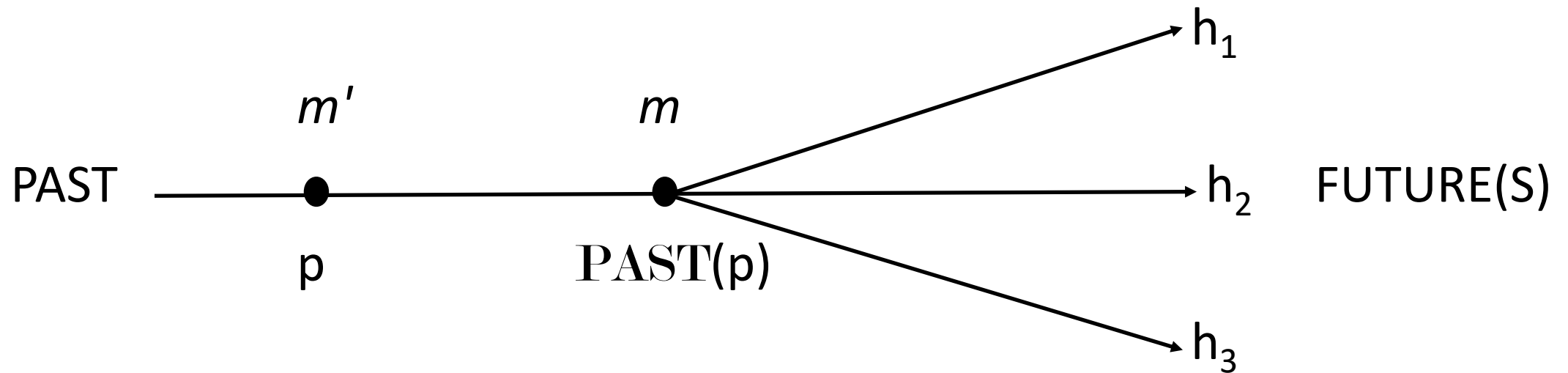
Past tense in Branching Time

- $[[\text{PAST}(p)]]^m = 1$ iff for some $m' < m$, $[[p]]^{m'} = 1$
($\text{PAST}(p)$ is true at m if and only if p is true at a moment m' preceding m)



Past tense in Branching Time

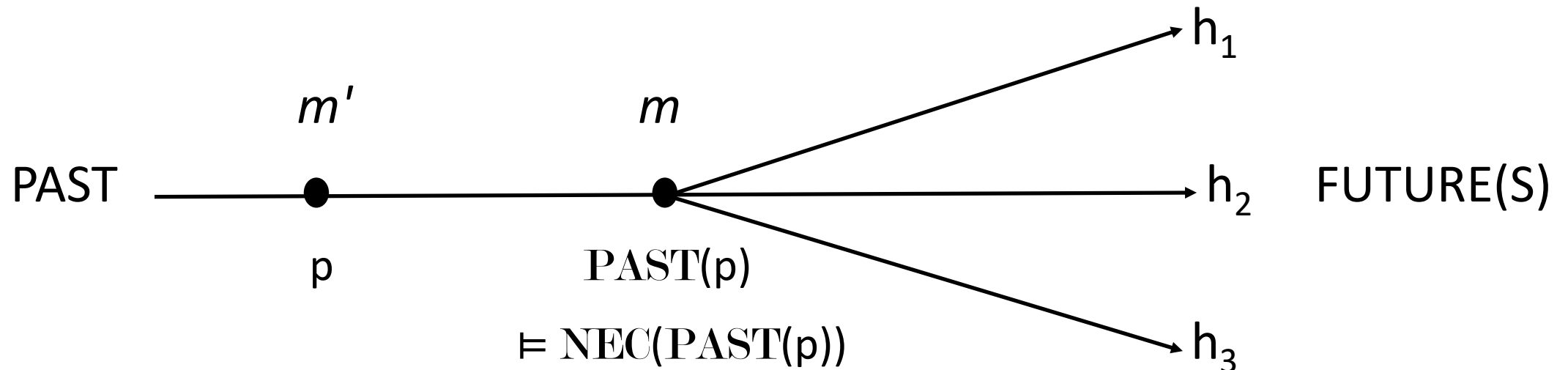
- Since there is a unique history going backward from moment m , the past tense does not raise a problem of definition in the same way as the future tense does; we just look at that unique past history, to check whether p holds on it or not.



A corollary: the necessity of the past in Branching Time

- Given Branching Time, there is a sense in which $\text{PAST}(p)$, unlike $\text{FUT}(p)$, when true, is not just *contingently* true: if p is now past, then it is now *necessary* that p is past – in symbols,

$$\text{PAST}(p) \rightarrow \text{NEC}(\text{PAST}(p))$$



SECTION 3

THE PUZZLE OF THE CHANGING PAST
(Barlassina and Del Prete 2015)

First point

We say true (false) things about the past ...

... and the truth (falsity) of what we say depends on how the past is.

Some terminology

- I. People utter sentences at *contexts*, which we represent as pairs $\langle w, t \rangle$.
- II. Sentences express *propositions* at contexts.
- III. A sentence S is *temporally specific* if and only if, for any context c , the proposition expressed by S at c is about a specific time.
- IV. A sentence S is *about the past* in a context c if and only if the proposition expressed by S at c is about a time that precedes c .

More precisely

- A temporally specific sentence S that is about the past in a context c is **true in c** if and only if the time the proposition p expressed by S in c is about has, relative to the past of c , the property that p ascribes to it.
- ‘Obama was born in 1961’ is **true in $\langle @, 23^{\text{rd}} \text{ May } 2019 \rangle$** if and only if, relative to the past of $\langle @, 23^{\text{rd}} \text{ May } 2019 \rangle$, the year 1961 has the property of being a time in which Obama was born.

July 2000: The champion



Context A: <@, Christmas 2002>

(1) Lance Armstrong won the Tour de France in 2000.

October 2012: No longer the champion



Context B: <@, Christmas 2013>

(1) Lance Armstrong won the Tour de France in 2000.

Another definition

- V. A context c' is a *successive same-world context* to context c if and only if:
- (i) the world of c' is the same as the world of c ,
 - (ii) the time of c' follows the time of c .

Second point

(1) Lance Armstrong won the Tour de France in 2000.

- Sentence (1) is a **temporally specific** sentence: for any context c , the proposition expressed by (1) at c is about the year 2000.
- Context B is a **successive same-world context** to Context A.
- Sentence (1) is **about the past** in both Context A and Context B.
- Sentence (1) takes **different truth-values** in Context A and Context B.

Third point

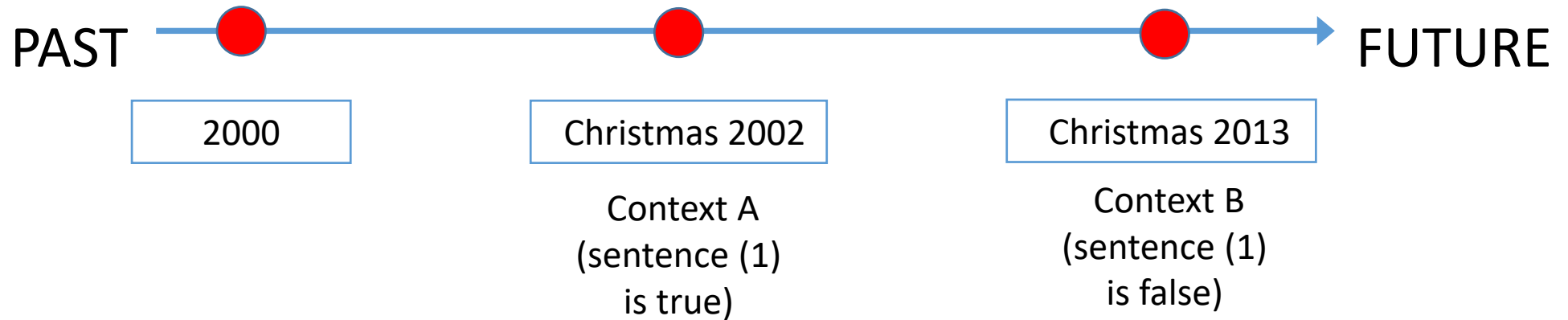
VI. A sentence is *context-insensitive* if and only if it expresses the same proposition at all contexts.

(1) Lance Armstrong won the Tour de France in 2000.

(2) *that Lance Armstrong won the Tour de France in 2000.*

Putting things together

(1) Lance Armstrong won the Tour de France in 2000.



The past has changed!!



Objection 1: No truth value change

First variant of Objection 1

- Sentence (1) was **already false** in Context A because Armstrong got the lowest time only by doping himself, thus by *cheating*.
- One cannot be the winner if one cheats!

Barlassina & Del Prete's reply

- This objection conflates the property *being the winner* with the property *being the person who deserves to win*.
- The property *being the winner* only depends on a **deliberation by a competent authority**:
if an authority declares x to be the winner, x is the winner—regardless of whether x cheated or not.

La mano de dios



Second variant of Objection 1

- Sentence (1) was **still true** in Context B.
- Sincere and informed speakers seem to assert (1), or sentences implying (1), after the revocation of Armstrong's titles.

(3) Armstrong won the Tour de France seven times from 1999 to 2005. He was later stripped of those titles for doping.

(USA Today, June 28th 2013)

Barlassina & Del Prete's reply: step 1

- Sincere and informed speakers assert sentences that imply that (1) would be **false** if uttered after the revocation of Armstrong's titles:

(4) Who won the Tour de France 1999-2005? No one.

(Law, Economics & Cycling, October 22nd 2012)

(5) Lance Armstrong is no longer the winner of the Tour de France from 1999-2005.

(Christian Prudhomme, Director of the Tour de France, from CBSNews, October 22nd 2012)

Barlassina & Del Prete's reply: step 2

- If (3) implied (1), adding to (3) the sentence *Armstrong never won any Tour de France in the end* should result in a contradiction, given that the latter sentence and (1) are logically incompatible.
- However, (6) is perfectly consistent!

(6) Armstrong won the Tour de France seven times from 1999 to 2005. He was later stripped of those titles for doping. *So, Armstrong never won any Tour de France in the end.*

Objection 2: Context-sensitivity

- The verb phrase ‘win the Tour de France in 2000’ is **context-sensitive**.
- (1) expresses **different propositions** at Context A and Context B:
 - (1a) *that Lance Armstrong won the Tour de France in 2000 according to the declaration of Context A* (call it “Declaration α ”).
 - (1b) *that Lance Armstrong won the Tour de France in 2000 according to the declaration of Context B* (call it “Declaration β ”).

Barlassina & Del Prete's reply

- Having come to know that Armstrong's titles have been revoked by declaration β , you assert (7) at Context B:

(7) It is no longer the case that Lance Armstrong won the Tour de France in 2000.

- (7) is true in Context B.

Barlassina & Del Prete's reply

- On the contextualist analysis, (7) expresses proposition (8) at Context B:

(8) that it is no longer the case that Lance Armstrong won the Tour de France in 2000 according to declaration β .

- However, (8) has a **presupposition that is false** in the circumstance of Context B, namely: *that it was once the case that Armstrong won the Tour de France in 2000 according to declaration β .*

Conclusion

- Barlassina and Del Prete (2015) have shown that both the “No Truth-Value Change” objection and the “Context-sensitivity” objection to their outrageous conclusion are problematic. So, maybe, the past can really change.
- One should stop asking *whether* the past can change and start to think *how* this could be.
- How to make sense of this idea?

THANKS!



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